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Oprema za varovanje dihal – Metode preskušanja – 3. del: Ugotavljanje dihalne upornosti

Respiratory protective devices - Methods of test - Part 3: Determination of breathing resistance

Atemschutzgeräte - Prüfverfahren - Teil 3: Bestimmung des Atemwiderstandes

Appareils de protection respiratoire - Méthodes d'essai - Partie 3: Détermination de la résistance respiratoire

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Respiratory protective devices - Methods of test - Part 3: Determination of breathing resistance

Appareils de protection respiratoire - Méthodes d'essai - Partie 3: Détermination de la résistance respiratoire

Atemschutzgeräte - Prüfverfahren - Teil 3: Bestimmung des Atemwiderstandes

This European Standard was approved by CEN on 17 August 2001.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

page

Foreword 3

Introduction 4

1 Scope 4

2 Normative references 4

3 Terms and definitions 4

4 Pre-requisites 4

5 General test requirements 5

6 Method 1: Static breathing resistance 5
6.1 Principle 5
6.2 Equipment 5
6.3 Procedure 5
6.3.1 Ambient conditions 5
6.3.2 Procedure for filters 5
6.3.3 Procedure for other devices 6

7 Method 2 : Dynamic breathing resistance 6
7.1 Principle 6
7.2 Equipment 7
7.3 Procedure 7
7.3.1 General 7
7.3.2 Inhalation resistance 7
7.3.3 Exhalation resistance 7

Annex A (normative) Fitting procedure for hoods which seal around the neck and which may or may not incorporate a head harness 13
A.1 Introduction 13
A.2 Principle 13
A.3 Apparatus 13
A.3.1 Sheffield dummy head/torso 13
A.3.2 Stand and elastic string, for hoods which do not incorporate a head harness 13
A.3.3 Adjustable collar 13
A.4 Procedure 14

Annex B (normative) Test results - Uncertainty of measurement 17

Annex ZA (informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives. 18

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 79, "Respiratory protective devices", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2002, and conflicting national standards shall be withdrawn at the latest by March 2002.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this standard.

EN 13274-3 is one of several Parts, which are as follows:

Part 1: Determination of inward leakage and total inward leakage

Part 2: Practical performance tests

Part 3: Determination of breathing resistance

Part 4: Flame tests

Part 5: Climatic conditions

Part 6: Determination of carbon dioxide content of inhalation air

Part 7: Determination of aerosol penetration of particle filters

Part 8: Determination of dolomite dust clogging of particle filters

The annexes A and B are normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This European Standard is intended as a supplement to the specific device standards for respiratory protective devices. Test methods are specified for complete or parts of devices. If deviations from the test method given in this standard are necessary, these deviations will be specified in the relevant device standard.

1 Scope

This European Standard specifies the general procedure for measurement of breathing resistance of filters for respiratory protective devices and respiratory protective devices incorporating facepieces, except for diving for respiratory protective devices. The requirements and any special conditions for the apparatus, and of filter measurements are described in the relevant device standard.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 132, *Respiratory protective devices – Definitions.*

3 Terms and definitions

For the purposes of this European Standard, the definitions given in EN 132 apply, together with the following:

3.1
inhalation resistance
flow resistance of the device during inhalation

3.2
exhalation resistance
flow resistance of the device during exhalation

3.3
static breathing resistance
inhalation resistance or exhalation resistance at defined constant flow expressed as a pressure difference measured between ambient and a specified point within the device

3.4
dynamic breathing resistance
peak inhalation resistance or peak exhalation resistance at a defined sinusoidal flow expressed as a pressure difference measured between ambient and a specified point within the device

4 Pre-requisites

In order to implement this European Standard, at least the following parameters shall be specified in the relevant device standard:

— number of specimens;

— specimen pre-conditioning;

— which test method (1 or 2);

— mounting of the specimen;

— preparation of the specimen;

— which flow rates;

— deviations;

— number of repeat tests per specimen;

— size of facepiece;

— orientation of support for device;

— pass/fail criteria.

5 General test requirements

Unless otherwise specified, the values stated in this European Standard are expressed as nominal values. Except for temperature limits, values which are not stated as maxima or minima shall be subject to a limit deviation of ± 5 %. Unless otherwise specified, the ambient temperature for testing shall be between 16 °C and 32 °C and the temperature limits shall be subject to a limit deviation of ± 1 °C.

6 Method 1: Static breathing resistance

6.1 Principle

The device is mounted on a support as described in the relevant device standard, and air is passed through the device at a constant flow.

NOTE The convention of reporting breathing resistance is that if during the inhalation resistance test, the pressure inside the facepiece relative to atmosphere is negative, no sign is used in front of the result. If the relative pressure inside the facepiece is positive, the result is prefixed with a '+'.

6.2 Equipment

6.2.1 Pressure gauge, calibrated in the appropriate range and with a sensitivity better than 10% of the limit value of breathing resistance specified in the relevant device standard.

6.2.2 Flowmeter(s) calibrated in the appropriate range.

6.2.3 Regulated blower/compressed air source or a variable suction device.

6.2.4 Support for the device (e.g. filter holder, Sheffield dummy head with insert or torso with insert) as described in the relevant device standard.

6.3 Procedure

6.3.1 Ambient conditions

If ambient conditions differ from 23 °C and 1 bar absolute, all flow rates shall be adjusted so that they give the correct flow rate when corrected to 23 °C and 1 bar absolute.

6.3.2 Procedure for filters

Two methods of passing air through the filter are possible and typical examples are shown in Figures 1a) and 1b). The first method employs a chamber in which the filter holding device is fixed (see Figure 1a)). Air is directed into

the chamber from a suitable controlled source and exits through the filter and holder system. The pressure drop across the system to ambient is measured at a pressure tapping mounted on the chamber wall. The second method draws air through the filter holding device (see Figure 1b)) and the pressure drop is measured between ambient and a pressure port fitted at a suitable point between the filter holding system and the connection to the suction device.

Ensure that the filter has been pre-conditioned according to the relevant device standard and that an equipment connector or the holder intended by the manufacturer to be used is available.

Mount the filter in a leaktight manner for horizontal airflow as indicated in Figures 1a) or 1b). Pass the appropriate airflow through the filter holding system. Measure and record the pressure drop, ΔP_F, across the filter holding system

Remove the filter. Pass the same airflow through the filter holding system. Measure and record the pressure drop, ΔP_H, of the set-up.

Report the breathing resistance of the filter at the flow rate as:

$$\Delta P_F - \Delta P_H$$

6.3.3 Procedure for other devices

Ensure that the device has been pre-conditioned according to the relevant device standard.

Fit the device in a leaktight manner without deformation on the Sheffield dummy head (see Figure 2) or torso (see Figure 3). Close off the tube for exhalation air, and the pressure port on the exhalation tube shown in Figure 3. See also Figure 4.

For hoods fitting around the neck, the fitting procedure given in annex A (see Figure A.1) shall be used.

For measurements of inhalation resistance, connect the inhalation tube to a suitable suction device and the pressure gauge connections to the pressure port and ambient respectively. Note the "zero" reading. Switch on and adjust the suction device to give the appropriate flow and note the pressure reading. Record the reading, corrected for the "zero" reading, as the inhalation resistance.

For measurements of exhalation resistance, connect the exhalation tube to a suitable blower and the pressure gauge connections to the pressure port and ambient respectively. Note the "zero" reading. With the support in one of the five defined orientations,

a) upright and facing directly ahead;

b) facing vertically, upwards;

c) facing vertically, downwards;

d) lying on the left side;

e) lying on the right side;

switch on and adjust the blower to give the appropriate flow and note the pressure reading. Record the reading, corrected for the "zero" reading, as the breathing resistance on exhalation at that orientation. Repeat the procedure with the support successively placed in the other orientations. Report the highest value of the five results as the exhalation resistance.

7 Method 2 : Dynamic breathing resistance

7.1 Principle

The device is mounted on a support as described in the relevant device standard and connected to a breathing machine adjusted to a specified breathing minute volume.

NOTE The convention of reporting breathing resistance is that if during the inhalation resistance test, the pressure inside the facepiece relative to atmosphere is negative, no sign is used in front of the result. If the relative pressure inside the facepiece is positive, the result is prefixed with a '+'.

7.2 Equipment

7.2.1 Breathing machine performing sinusoidal breathing.

7.2.2 Support as described in the relevant device standard, e.g. Sheffield dummy head with insert or torso with insert (see Figures 2, 3 and 4).

7.2.3 Pressure gauge, calibrated in the appropriate range and with a sensitivity better than 10 % of the limit value of breathing resistance specified in the relevant device standard.

The response time of this pressure gauge, including the recording device, shall be less than 30 ms. for a response of 10 % to 90 % of the full scale deflection of the range used.

7.3 Procedure

7.3.1 General

If ambient conditions differ from 23 °C and 1 bar absolute, all flow rates shall be adjusted so that they give the correct flow rate when corrected to 23 °C and 1 bar absolute.

Ensure that the device has been pre-conditioned in accordance with the relevant device standard.

Adjust the breathing machine in accordance with Table 1 to give the breathing minute volume specified in the device standard.

Connect one port of the pressure gauge to the pressure port of the support for the device and the other port to ambient. Connect the pressure gauge to the recording device.

Fit the device in a leaktight manner without deformation on the support. For hoods sealing around the neck, the fitting procedure given in annex A (see Figure A.1) shall be used. Note the "zero" reading of the pressure gauge. Switch on the breathing machine and operate the device as defined in the relevant device standard and record the peak pressure.

7.3.2 Inhalation resistance

Record the peak pressure on inhalation. Record the reading, corrected for the 'zero' reading, as the inhalation resistance.

7.3.3 Exhalation resistance

With the support in one of the five defined orientations :

a) Upright and facing directly ahead;

b) facing vertically, upwards;

c) facing vertically, downwards;

d) lying on the left side;

e) lying on the right side;

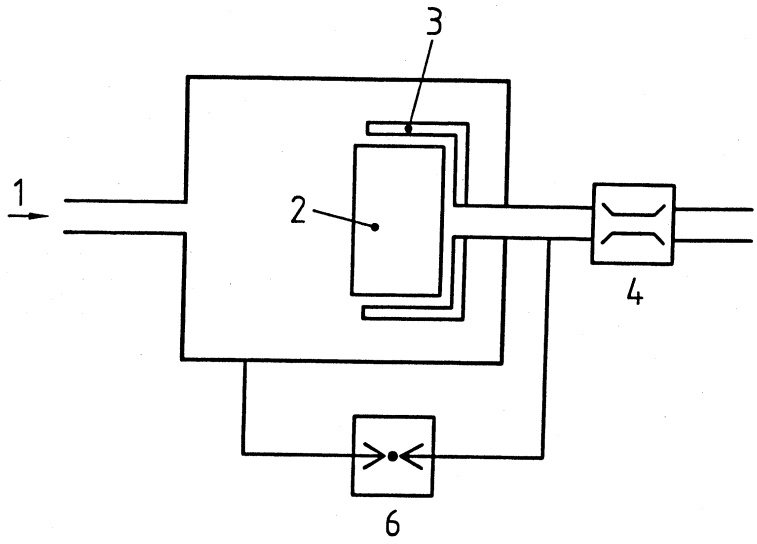
note the peak pressure reading on exhalation. Record the reading, corrected for the 'zero' reading, as the exhalation resistance at that orientation. Repeat the procedure with the support successively placed in the other orientations. Report the highest value of the five results as the exhalation resistance.

Table 1 — Setting of the breathing machine to give specified breathing minute volumes

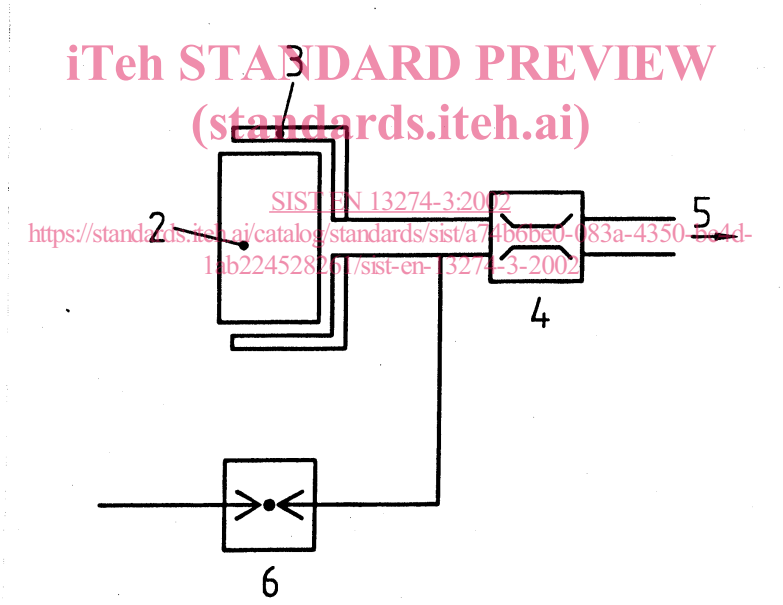
	Breathing minute volume l/min	Cycles/min	Volume per stroke l	Corresponding continuous flow specified in the relevant device standard l/min
A	10,0	10	1,00	30
B	30,0	20	1,50	95
C	35,0	20	1,75	110
D	40,0	20	2,00	125
E	50,0	25	2,00	160
F	62,5	25	2,50	195
G	70,0	30	2,33	220
H	100,0	40	2,50	315

NOTE 1 The peak pressure equates to the pressure at a constant flow which is equal to the average breathing minute volume for a sinusoidal flow multiplied by π.

NOTE 2 When checking measurements at sinusoidal flow with those at constant flow, there should be good correlation when the constant flow rate is the sinusoidal flow average breathing minute volume multiplied by π.



a) 'Blowing through' device



b) 'Sucking through' device

Key

1 Regulated air source

2 Filter

3 Filter housing

4 Flowmeter

5 Regulated suction

6 Pressure gauge

Figure 1 —Examples of arrangement for measurement of breathing resistance of filters